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(54) Adjustable joint

(57) A joint between shafts (3, 4), whereby the angular position of the shafts relative to each other is adjustable for use in for example the construction of stands is provided. Each shaft (3, 4) bears a ball member (5, 6) and the joint comprises a pair of thermoplastic plates (7, 8) having opposing faces, containing a plurality of recesses (9 to 12), the plates being held together by adjustable fastening means (13) such that each ball member (5, 6) is rotatably held between opposing recesses in the plates with the respective shaft (3, 4) extending out from the joint between the plates and one or both of the opposing plate faces having one or more projections (17, 18) therefrom such that on tightening of the fastening means, the plate faces are prevented from being brought sufficiently close together for the joint to fail.

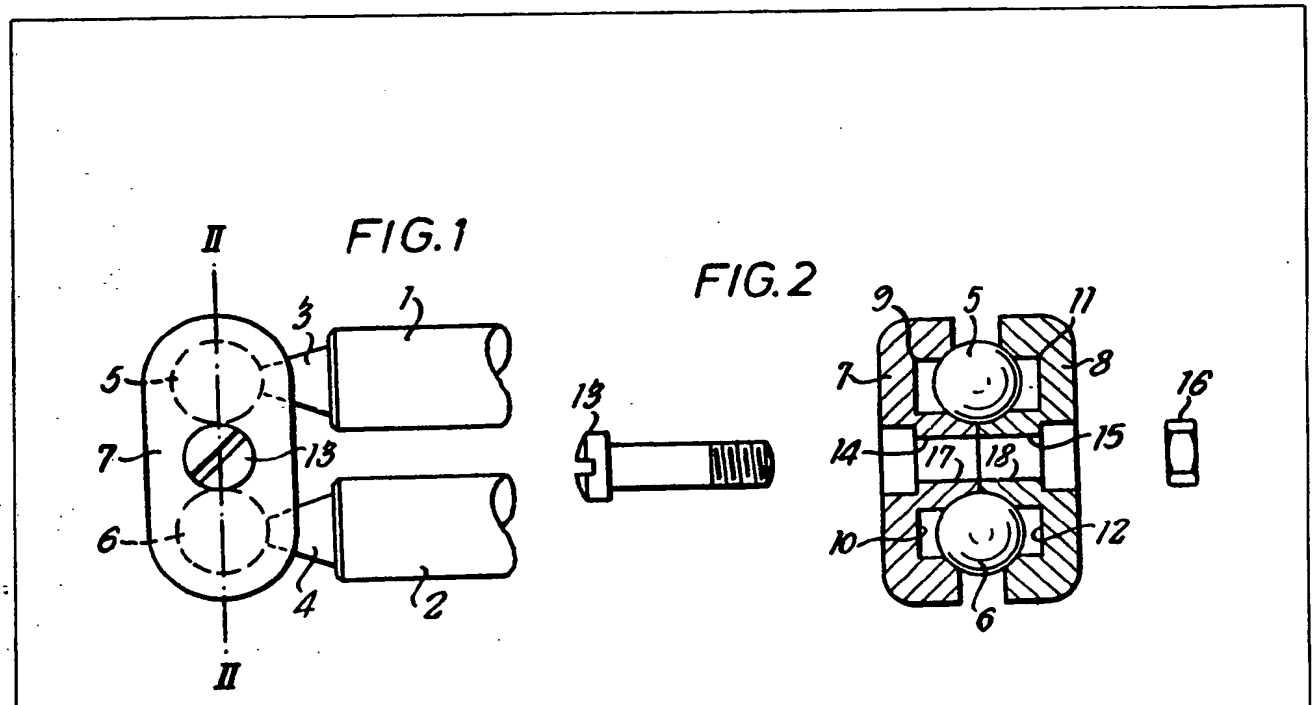

FIG. 1

FIG. 2

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FIG. 1

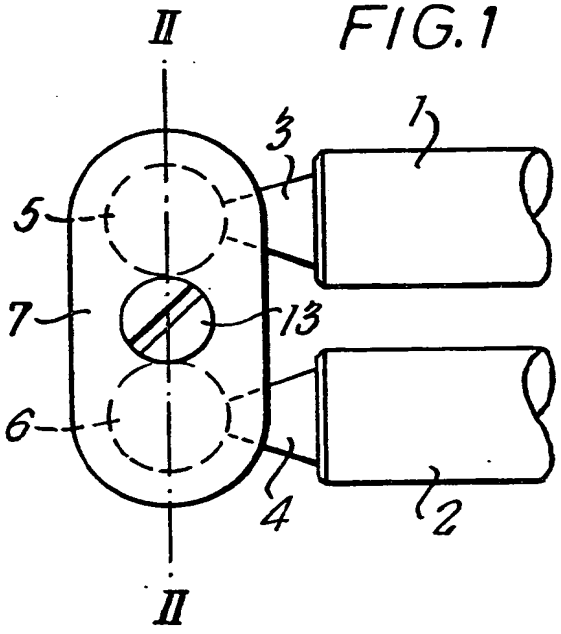
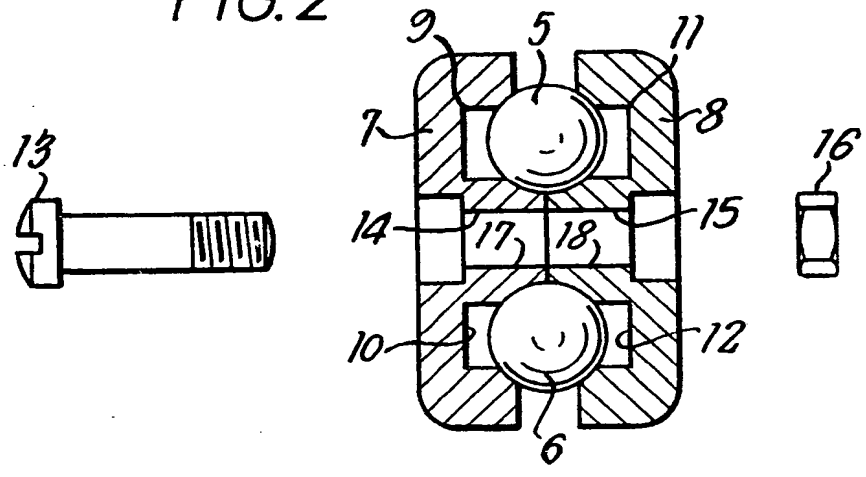


FIG. 2



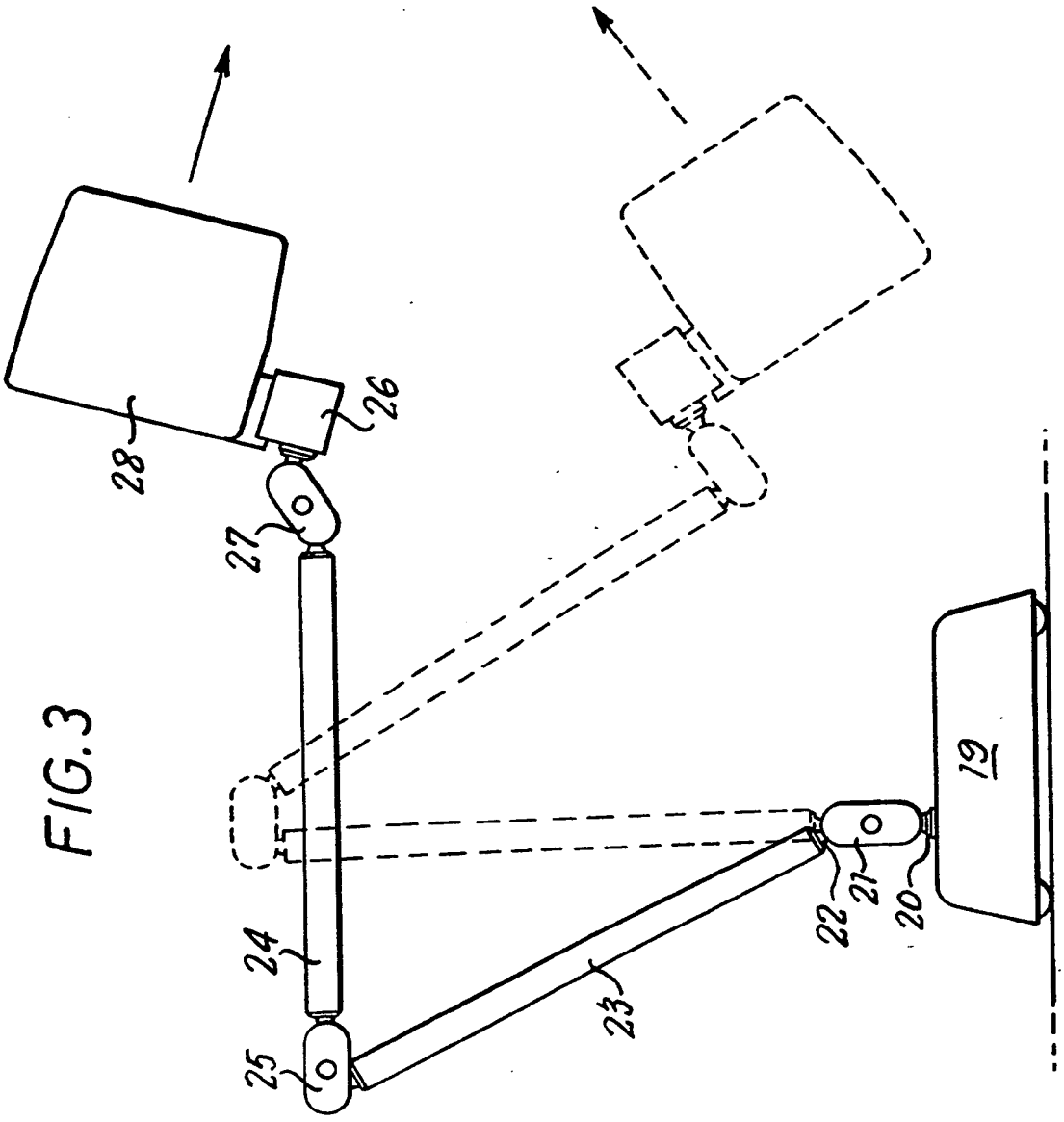


FIG.3

FIG.4

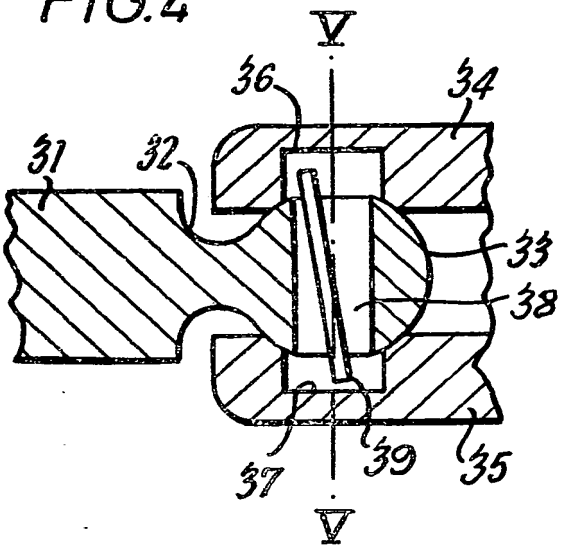
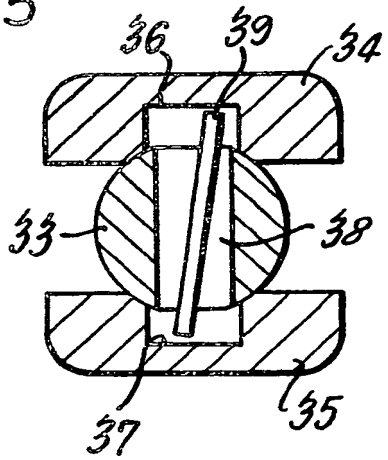


FIG.5



SPECIFICATION

Adjustable joint

This invention relates to a joint between shafts, whereby the angular position of the shafts relative to each other is adjustable.

There are many situations in which it is required to have a joint between shafts such that the angular position of the shafts relative to each other may be adjusted through substantially 360°. Such joints are for example found in reading lamps (of the "Anglepoise" type) where it is required that the position of the lamp be highly adjustable so that the reader may have illumination where he requires it. Of course there are many other situations, both in the home and in the office, where such adjustability is required or desirable. ["Anglepoise" is a registered Trade Mark.]

According to the present invention, there is provided a joint between shafts, each shaft carrying a ball member wherein the joint comprises a pair of plates of thermoplastic material, the plates having opposing faces each of which contains a plurality of recesses, the plates being held together by adjustable fastening means with each ball member rotatably held between opposing recesses in the plate faces with the respective shaft extending out from the joint between the plates, and one or both of the opposing plate faces having one or more projections therefrom such that on tightening of the fastening means, the plate faces are prevented from being brought sufficiently close together for the joint to fail.

In the joint according to the present invention therefore each ball member is held between a recess in one of the plates and an opposing recess in the other plate. Providing accordingly that the plates are not made of excessively high friction material or the plates are secured too firmly together, each ball member can rotate within the joint allowing the shafts to move with respect to each other through a wide angle.

By altering the tightness of the fastening means holding the plates together, the force on the ball members between the plates is altered and therefore the friction within the joint is altered. Suitably the tightness of the fastening means is such that the shafts may be movable when force is applied but will retain the desired position when the force is removed. Exactly what this tightness will be therefore will depend upon the proposed use for the joint, in particular the loading to be applied to it.

The simplest and most effective joint structure according to the present invention is provided for the joining of two shafts, each thermoplastic plate containing a pair of recesses for the ball members and the fastening means, suitably a screw, passing through the plates at substantially their midpoint between the two recesses and therefore between the two ball members. Tightening of the screw will move the plates inwards towards each other increasing the pressure on the ball members and accordingly tightening the joint. On the other hand, unscrewing will cause the plates to move away from each other and therefore loosen the joint.

The joint plates are suitably moulded from the thermoplastic material. Accordingly it will be appreciated that the joints can be manufactured very cheaply to give a joint of highly variable configuration. Over-tightening of the fastening means would cause the thermoplastic material to fail and therefore break the joint. Accordingly one or both of the opposing plate faces is provided with one or more projections. The projection(s) prevent(s) over-tightening by preventing the plates being brought too close together and therefore failing.

Joints according to the present invention may suitably be employed in a stand for adjustable illumination means. Thus a ball member on a shaft fixed to a base may be joined through a joint according to the present invention to a ball member on a shaft at one end of a first rod, for example of aluminium. This rod may itself, *via* a similar joint, be joined to a second rod which second rod in its turn is joined *via* an adjustable joint to the mounting for the illumination means. Such a stand accordingly comprises three adjustable joints according to the invention leading to great possibilities of variation in the position of the illumination means. Such a stand can for example be used to support a flashgun in flash photography in order to permit the flashgun easily to be placed in different positions. Alternatively the stand could be used to support a light for reading or inspection purposes. However other non-illumination uses for such a stand can also be envisaged such as a clamp for use in holding specimens or work in a laboratory or workshop or for holding a lens for use by for example stamp collectors.

In some applications it may be desirable to restrict the angular movement in the joint. For example when the joint is used in a lamp stand it may be desirable to restrict the angular movement of the rods of the stand by restricting that within the joint to prevent damage to the lamp wire. This may suitably be achieved by means of a pin passing through each ball member. In the joint the ends of the pin are held captive in the opposing recesses so that the movement of the ball members in the joint is restricted. The amount of angular movement in the joint can be varied by means of the sizes of the pins used, the width of the holes through which the pins pass and the size of the recesses.

The invention is further illustrated, by way

of example, with reference to the accompanying drawings in which:

Figure 1 shows a joint according to the present invention, the shafts being shown in parallel,

Figure 2 shows a section along the line II–II of Fig. 1 but with the fastening means in exploded position,

Figure 3 shows an adjustable stand employing joints according to Figs. 1 and 2,

Figure 4 shows a section through one end of a modified joint according to the invention, and

Figure 5 is a section along the line V–V of Fig. 4.

With reference to Figs. 1 and 2, two rods 1 and 2 each bear a shaft 3 and 4, on which is mounted a ball member 5 and 6 respectively. Plates 7 and 8 of moulded thermoplastics material have, in opposing faces, recesses 9 and 10, and 11 and 12 respectively. Ball member 5 is thus held between recesses 9 and 11 of plate members 7 and 8 and ball member 6 is held between the opposing recesses 10 and 12 of the plate members. The whole is secured together by means of a screw 13 which passes through channels 14 and 15 in plate members 7 and 8 respectively at the midpoint between the recesses and is secured on the other side by means of a nut 16. For convenience, the screw head and nut are arranged flush with the exterior surface of the plate members. Between the recesses around the screw channels 14 and 15 each plate member 7, 8 has a projection 17, 18 respectively. In Fig. 2, the joint is shown with projections 17 and 18 in contact. Thus this is the position beyond which the joint cannot be tightened.

In use of the joint illustrated in Figs. 1 and 2, the ball members 5 and 6 are able to rotate between the recesses in the plate members 7 and 8. Thus if the angular position of rod 1 and with it shaft 3 is moved with respect to rod 2 ball member 5 rotates in its housing between the two plate members 7 and 8. Similarly if rod 2 is moved with respect to rod 1 the ball member 6 will rotate between the two plate members. When the moving force is removed from rods 1 and 2 they will retain their new positions with the ball members 5 and 6 held between plates 7 and 8. Of course the positions may not be held if the loading attached to either of rods 1 and 2 is too great or if the ball members 5 and 6 are not sufficiently tightly held between plate members 7 and 8. In these circumstances the screw 13 may be tightened in the nut 16 drawing the two plate members together and therefore increasing the tightness of the joint. Over-tigtening of the joint causing failure of the thermoplastic mouldings is avoided because the plate members 7 and 8 cannot be forced any closer together than the position in which projections 17 and 18 are in contact. The dimensions of projections 17 and 18 are such that, when they are in contact, the ball members 5 and 6 are firmly held between the plate members without the plate members being put under such a strain that they are caused to fail. Of course in addition if the joint is too stiff it may be loosened by loosening the screw 13 to make the plate members 7 and 8 move away from each other.

Fig. 3 shows a stand, for example, for a flashgun, employing three joints in accordance with Figs. 1 and 2. One configuration of the stand is shown in solid line and another configuration is shown in dotted line.

The stand comprises a base 19 joined to which is a shaft 20 carrying a ball member (not shown). This ball member is within a joint 21 in accordance with Figs. 1 and 2 with a ball member mounted on a shaft 22 at one end of an aluminium rod 23. Aluminium rod 23 is connected at its other end to one end of a second aluminium rod 24 through a similar joint 25 housing ball members joined to the shafts of rods 23 and 24. The other end of rod 24 is in turn connected to a flashgun shoe 26 through a third joint 27. In the embodiment illustrated the flashgun shoe is provided with a flashgun 28 which throws light in the direction indicated by the solid arrow.

Alteration of the position of flashgun 28 may be achieved by rotation of any one of the ball members in its respective joint. Thus to obtain the configuration shown in dotted line in Fig. 3 the ball member on shaft 22 of rod 23 is rotated within joint 21, the ball member at the other end of rod 23 is rotated in joint 25 and similarly the ball member of rod 24 in joint 25 is rotated. Also both ball members are rotated within joint 27 to alter the position of flashgun shoe 26 and with it flashgun 28 so that illumination of the flashgun becomes directed in the direction indicated by the dotted arrow. Of course the tightness of the joints 21, 25 and 27 should be such that once the required new position is reached that new position is held.

It will be appreciated that by different amounts of movement within the various joints many different positions and angles for the flashgun 28 can be achieved with ease. Thus in photography great variation in the illumination of a subject can be obtained. Similarly if in place of the flashgun there is used a reading light, the position of this may be adjusted to provide optimum illumination. Any power cable required to the lamp can for example be simply clipped to the rods 23 and 24. Alternatively with hollow rods i.e. tubes, the power cable can be run along the instead, the cable passing through holes in the tubes adjacent the joints.

Referring now to the modified joint of Figs. 4 and 5, rod 31 bears a shaft 32 on which is

mounted a ball member 33. Plates 34 and 35 of moulded thermo-plastics material have, in opposing faces, recesses 36 and 37 respectively. [Plates 34 and 35 may be the same shape as plates 7 and 8 of Figs. 1 and 2.]

The ball member 33 has a hole 38 bored therethrough and a pin 39 passes through hole 38 such that the ends of the pin 39 are held captive in the recesses 36 and 37.

In a similar fashion to the embodiment of Figs. 1 and 2, the ball member 33 is able to rotate between the recesses in the plate members 34 and 35 when the angular position of rod 31 is moved. However when the angular position of the rod 31 is changed (i.e. the rod is rotated about its axis) there comes a position in which the ends of captive pin 39 bear against the side walls of the recess. Further angular movement is then prevented.

CLAIMS

1. A joint between shafts, each shaft carrying a ball member wherein the joint comprises a pair of plates of thermoplastic material, the plates having opposing faces each of which contains a plurality of recesses, the plates being held together by adjustable fastening means with each ball member rotatably held between opposing recesses in the plate faces with the respective shaft extending out from the joint between the plates, and one or both of the opposing plate faces having one or more projections therefrom such that on tightening of the fastening means, the plate faces are prevented from being brought sufficiently close together for the joint to fail.

2. A joint according to claim 1 for joining two shafts wherein each plate contains a pair of recesses for the ball members and the fastening means holds the plates together at substantially the midpoint between the two recesses.

3. A joint according to claim 2 wherein the fastening means comprises a screw which passes through the plates at their midpoint, which screw is secured by means of a nut.

4. A joint according to any one of the preceding claims wherein at least one of the ball members has a hole therethrough and the joint also comprises a pin in the hole in the ball member, the ends of the pin being held captive in the opposing recesses of the plates.

5. A joint between shafts, each shaft carrying a ball member substantially as illustrated in and described with reference to Figs. 1 and 2 of the accompanying drawings.

6. A joint between shafts, each shaft carrying a ball member substantially as illustrated in and described with reference to Figs. 4 and 5 of the accompanying drawings.

7. An adjustable stand which comprises a base provided with a ball member on a shaft joined through a joint according to any one of the preceding claims to a ball member on a shaft at one end of a first rod, the other end of the first rod being provided with a shaft and ball member joined by a joint according to any one of the preceding claims to a ball member on a shaft at one end of a second rod, and the second rod having at its other end a ball member on a shaft which is joined via a joint according to any one of the preceding claims to a ball member and shaft on support means.

8. A stand substantially as illustrated in and described with reference to Fig. 3 of the accompanying drawings.

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